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ABSTRACT

The purpose of this study was to determine whether or not children manifesting different cognitive styles also behave differently in small-group instructional situations. Six groups of seven children each engaged in a small group videotaped learning experience in which they were to learn the English equivalent of 75 symbols. Analysis of the data showed no differences between impulsive and reflective children on total number of responses, total number of correct responses, total number of correct first responses, ratio of correct responses/total number of responses, and time to first response. Results were discussed with respect to the generality of the conceptual tempo construct. (Author)

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BEHAVIORAL CORRELATES OF CONCEPTUAL TEMPO[1]

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According to Kagan (Kagan, et al., 1964), the extent to which a child pauses to evaluate the quality of his cognitive products is important for all facets of the child's cognitive activities - influencing the quality of initial encoding, decoding, recall and hypothesis generation. Some children respond very quickly to stimulus demands and are wrong. They are called impulsive. Other children in similar situations take more time to respond and answer correctly. They are referred to as reflective.

Since 1964, an extensive series of studies has been conducted dealing with this "conceptual tempo" dimension of cognitive style. This behavioral construct described in terms of individuals' response latencies and error rates, manifests itself in response to stimuli having high response uncertainty (Kagan, Rossman, Day, Albert, and Phillips, 1964), and is most commonly measured by the Matching-Familiar-Figures (MFF) Test.

Descriptive and correlational research has shown that when stimulus conditions involving high response uncertainty are present, reflective children perform qualitatively better than impulsive children on a wide variety of tasks including visual discrimination (Kagan, et al., 1964; Adams, 1972), word recognition (Kagan, 1965; Roettger, 1971), inductive reasoning (Kagan, 1966; Kagan, Pearson and Welch, 1966), serial recall and problem solving (Adams, 1972; Ault, 1973) thus supporting the generality of the conceptual tempo variable to a number of varied perceptual and cognitive activities.

Though the generality of the impulsivity-reflectivity phenomenon as it relates to other one-to-one testing situations has been studied, no studies have been conducted to demonstrate whether or not children with these two response styles in fact "behave" differently from each other in larger group-interaction settings. Any behavioral differences would hold important implications for the modification and understanding of impulsivity in classroom situations (e.g. Yando and Kagan, 1968), and would be of theoretical importance with respect to the generality and utility of the conceptual tempo construct itself. It was for these reasons that the following study was undertaken.

METHOD

Subjects

Fourth and sixth grade boys were administered the Matching-Familiar-Figurest (MFF) Test (Kagan, 1964) in order to determine which were impulsive and which were reflective. In this match to sample visual discrimination task, time to the child's first respon, and his number of errors are each totaled over twelve items. A double median split technique was used to determine which children were impulsive and which reflective. Reflective children were those who scored among the top half of the distribution in making the fewest errors, but in the bottom half of the distribution on response latency. Impulsive children score just the opposite - top half of the distribution on response latency (i.e. respond very quickly), but are in the bottom half of the error rate distribution, making many errors. After identifying pools of reflective and impulsive children, 30 impulsive and 12 reflective boys were randomly selected from each of these respective pools. Within each grade level, 5 impulsive and 2 reflective children were randomly selected and assigned to a group. This resulted in 6 groups in total - 3 groups of 4th grade boys with 5 impulsive and 2 reflective subjects in each group and 3 groups of 6th grade boys again with 5 impulsive and 2 reflective subjects in each group.

Procedures

Each group of 7 children was brought by one of the experimenters to an empty room in each of the three schools cooperating in this study. One group of 4th graders and one group of 6th graders participated in each school.

Upon arriving at the room the subjects were greeted by an experienced female teacher in her mid-30's and instructed to sit on one side of a table in two rows. There were 3 subjects in the front row and 4 in the back for three groups, and for the three remaining groups this was reversed. The teacher was the same for all lessons and was unfamiliar to all of the subjects. She had no knowledge of the purpose of the study, the composition of the groups or the MFF scores of any of the children. Each lesson lasted approximately 20 minutes and was videotaped with sound for later data analysis.

The teacher began the lesson by introducing herself and telling the subjects that she was going to show them some symbols and that they were to attempt to figure out what each symbol represented. She then began showing the cards one at a time. Each symbol was printed on a 3" x 5" card with the English language equivalent printed on the back. Many of these visual symbols were taken from the Rebus reading materials (Woodcock and Clark, 1969). These symbols were selected because they retained the feature of high response uncertainty common to the MFF discrimination tasks. There were 75 symbols in total. The teacher went through all 75 in order, only going on to the next symbol after a subject had figured out what it represented or she supplied the correct answer because the children were unable to figure it out. At no time did the teacher call on an individual subject, but rather allowed the subjects to respond voluntarily and spontaneously to each of the cards as they were shown. Each group went through the cards in the same sequence.

Data Analysis

The videotape data were first transformed onto a two-track audiotape. The videotape sound was put on one track. On the other track a .5 second "beep" sound was placed at the point at which the interaction and discussion of each symbol were terminated. This two-track audio tape was then played into a Honeywell Visicorder Oscillograph 1508 which produced a visual display of both the interaction sound sequence and the "beep" sound. The "beep" was placed on the audiotape in order to more accurately determine the average time to the first response made to a stimulus card and to provide additional cues to facilitate coding. A facsimile copy of the Oscillograph output appears in Figure 1. From this visual display and video tape playback combination it was possible to possible to obtain data on the following dependent

Insert Figure 1 here

variables:

(a) total number of responses per child

(b) toal number of correct responses per child

(c) total number of first responses per child

(d) total number of correct first responses per child

(e) ratio of total number of correct responses/total number of responses per child

(f) average time to first response for the child who gave the first response

Response as it is used here refers to each occasion on which a subject suggested a possible meaning for the presented symbol. Total number of responses refers to the number of times each subject offered such a suggestion; total number of correct responses refers to the number of times the child's suggestion was correct; total number of firstresponses refers to the number of times a response made by a given subject was

the first response made in the group; total number of correct first responses refers to the number of occasions on which a given child made the first response in a group and was correct; the ratio of total number of correct responses/total number of responses is a measure of the extent to which a subject is correct when he responds and average time to first response for the child who gave the first response is a measure of latency in a larger-group situation. Data on the above dependent variables were obtained for each subject in this study. Coders had no advanced knowledge of subjects' grade level or score on the MFF. Inter-rater reliabilities for each dependent variable are reported as percentage agreement and appear in Table 1. They are all above 85%.

Insert Table 1 here

RESULTS

A 2 x 2 x 2 analysis of variance model with 2 levels of grade (4th and 6th), 2 levels of position (front row and back row) and 2 levels of conceptual tempo (impulsive and reflective) was used to test for the effects of these variables. P-values greater than .05 were considered to be non-significant.

Table 2 contains the results of the 2 x 2 x 2 ANOVA with regard to the dependent variable of total number of responses. Both Position ($F=10.85$, $df=1/34$, $p < .002$)

Insert Table 2 Here

and grade main effects ($F=8.09$, $df=1/34$, $p < .007$), were found to be significant with subjects in the front row responding more often than subjects in the back row and fourth graders giving more responses than sixth graders.

Table 3 reports all means and standard deviations involved in significant effects.

Insert Table 3 Here

The results of the analysis of the total number of correct responses variable are

contained in Table 4. The main effect of position was found to be significant

Insert Table 4 Here

($F=7.59$, $df=1/34$, $p < .009$) with subjects in the front row having a greater number of correct responses than those in the back row. No other factors or interactions were found to be significant.

Table 5 contains the results of the 2 x 2 x 2 ANOVA with regard to the variable of total number of first responses. The main effect of position was again found to be

Insert Table 5 Here

significant ($F=4.57$, $df=1/34$, $p < .04$), with those children in the front row having a greater number of first responses as compared with those in the back row.

The results of the analysis of the total number of correct first responses are contained in Table 6. No significant differences were found for any of the main effects

Insert Table 6 Here

or interactions.

Table 7 contains the results of the 2 x 2 x 2 analysis with regard to the variable of ratio of total number of correct responses divided by the total number of responses. This variable gives some indication of the relative efficiency of responding (i.e. the

Insert Table 7 Here

extent to which an individual is correct when he responds). The main effect of grade was found to be significant ($F=10.23$, $df=1/34$, $p < .003$) with sixth graders having a higher rate of efficiency than fourth graders.

The results of the analysis of the average time to the first response variable are contained in Table 8 and no significant differences for any of the main effects or interaction terms were found.

Insert Table 8 Here

In summary, the results indicate (1) that there were no significant differences in the behavior of impulsive as compared to reflective subjects on any of the six dependent variables; (2) that there were no significant differences between any of the means involved in any interaction terms involving the conceptual tempo variable; (3) that children in the front row had a greater number of total responses, a greater number of correct responses, and a greater number of first responses when compared to children in the back row; and (4) that sixth grade subjects gave a fewer number of total responses and had a greater number of correct responses relative to the total number of responses, an index of response efficiency, as compared to fourth grade subjects.

DISCUSSION

The results indicated a position effect for 3 of the dependent variables with the subjects in the front row having a greater number of total responses, a greater number of correct responses and a greater number of first responses when compared with subjects in the back row. This finding may suggest an increased involvement on the part of front row subjects, a tendency for participating, vocal students to self-select themselves into positions near to the teacher, or simply, that front row subjects might have been able to see the symbols more clearly and thus decipher more effectively. Other researchers may be interested in looking at this variable particularly since subjects in front row positions seemed to engage in behaviors generally thought to be of value in instructional settings.

Results concerning the grade effect showed 6th graders to require fewer responses than 4th graders in order to determine the correct response. This finding of increased efficiency in learning for 6th graders as compared with 4th graders is consistent with other research and developmental theory.

Clearly though, the most important result of this study is the support for the statement of Kagan and Kagon (1970) that a subject's performance in the MFF situation need not generalize to other testing situations or general behavioral contexts. Kagan has, in fact, stated even more recently that findings obtained with the MFF test should be restricted to testing and generalizations about impulsivity-reflectivity with regard to problem-solving situations containing high-response uncertainty and that it has never been suggested that generalizations be made about the spontaneous behavior of children in natural settings (Kagan and Messer, 1975). Though Kagan may have been careful not to overgeneralize from his data, others have not been as cautious (e.g. Seggev, 1972; Briggs & Weinberg, in press). Currently, warnings abound with regard to the importance of environmental and situational factors in influencing human behavior (Moos, 1973) and of the dangers in overgeneralizing and predicting from one-to-one testing situations to behavior in naturalistic settings (Bersoff, 1973). Inasmuch as no significant differences were found between impulsive and reflective children on any of the 6 dependent variables, it would seem that Kagan's warning against overgeneralizing the conceptual tempo variable, and the warnings of others in reference to predicting behavior in more complex environments from one-to-one test data, must continue to be taken seriously.

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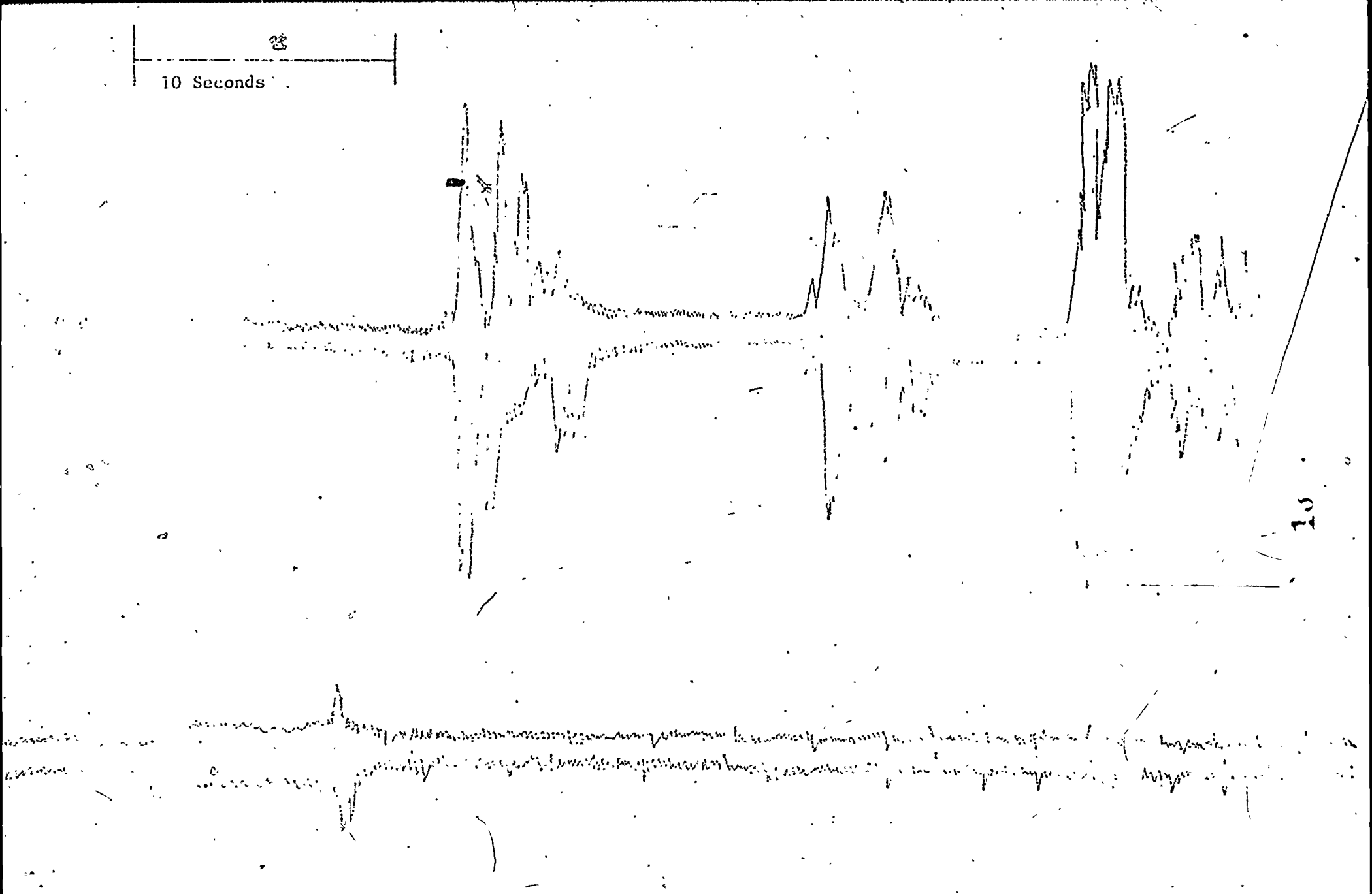

Figure 1. Facsimile Oscillograph printout. Straight Vertical lines are spaced at the rate of 10 per se
Top line is voice print. Bottom line is "Beep" track.

	d.f.	MS	F	p
Position (P)	1	15690.07	10.85	<.002
Grade (G)	1	11699.99	8.09	<.007
Conceptual Tempo (C)	1	314.90	.22	n.s.
PG	1	725.84	.50	n.s.
PC	1	43.60	.03	n.s.
GC	1	884.40	.61	n.s.
PGC	1	1678.24	1.16	n.s.
Within	34	1446.40		

Table 2. 2 x 2 x 2 ANOVA of Total number of responses

	d.f.	MS	F	p
Position (P)	1	184.80	7.59	<.009
Grade (G)	1	7.71	.32	n.s.
Conceptual Tempo	1	.00	.00	n.s.
PG	1	36.14	1.49	n.s.
PC	1	1.03	.04	n.s.
GC	1	7.35	.30	n.s.
PGC	1	34.64	1.42	n.s.
Within	34	24.36		

Table 4. 2 x 2 x 2 ANOVA of total number of correct responses

Dependent Variables	Position		Grade	
	front row	back row	4th grade	6th grade
total number of responses	$\bar{x}$ = 90.20 s.d. = 47.75	$\bar{x}$ = 51.50 s.d. = 31.78	$\bar{x}$ = 86.62 s.d. = 51.29	$\bar{x}$ = 53.2 s.d. = 28.2
total number of correct responses	$\bar{x}$ = 10.20 s.d. = 5.08	$\bar{x}$ = 6.00 s.d. = 4.49		
total number of first responses	$\bar{x}$ = 13.05 s.d. = 9.50	$\bar{x}$ = 7.27 s.d. = 7.20		
percentage of total number of correct responses/total number of responses			$\bar{x}$ = 9.10 s.d. = 5.29	$\bar{x}$ = 17.0 s.d. = 9.5

Table 3. Means and standard deviations of variables involved in significant analysis.

	d.f.	MS	F	p
Position (P)	1	349.66	4.57	<.04
Grade (G)	1	.02	.00	n.s.
Conceptual Tempo (C)	1	115.26	1.51	n.s.
PG	1	23.27	.30	n.s.
PC	1	42.40	.55	n.s.
GC	1	14.46	.20	n.s.
PGC	1	5.01	.07	n.s.
Within	34	76.50		

Table 5. 2 x 2 x 2 ANOVA of total number of first responses

	d.f.	MS	F	p
Position (P)	1	26.97	3.55	n.s.
Grade (G)	1	8.60	1.13	n.s.
Conceptual Tempo (C)	1	2.67	.35	n.s.
PG	1	23.50	3.09	n.s.
PC	1	2.32	.31	n.s.
GC	1	7.32	.96	n.s.
PGC	1	3.21	.42	n.s.
Within	34	7.60		

Table 6. 2 x 2 x 2 ANOVA of total number of correct first responses

	d.f.	MS	F	p
Position (P)	1	274242.19	.42	n.s.
Grade (G)	1	6610032.00	10.23	<.003
Conceptual Tempo (C)	1	110528.13	.17	n.s.
PG	1	820937.25	1.27	n.s.
PC	1	209801.56	.33	n.s.
GC	1	166174.06	.26	n.s.
PGC	1	24650.93	.04	n.s.
Within	34	646300.69		

Table 7. 2 x 2 x 2 ANOVA of percentage of total number of correct responses/total number of responses.

	d.f.	MS	F	p
Position (P)	1	6855.86	1.17	n.s.
Grade (G)	1	.22	.00	n.s.
Conceptual Tempo (C)	1	4596.15	.78	n.s.
PG	1	163.60	.02	n.s.
PC	1	5528.59	.94	n.s.
GC	1	1648.21	.28	n.s.
PGC	1	3114.46	.53	n.s.
Within	34	5870.38		

Table 8. 2 x 2 x 2 ANOVA of average time to first response.

Dependent Variable	Inter-rater % agreement
(a) total number of responses	86%
(b) total number of correct responses	100%
(c) total number of first responses	100%
(d) total number of correct first responses	88%
(e) percentage of total number of correct responses/total number of responses	
(f) average time to first response within + or - 2/10 second	100%

Table 1. Dependent variable inter-rater reliabilities in terms of percentage agreement.